

WHAT IS CLAIMED IS:

1. A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a plurality of viewpoints; and
5 a projecting unit configured to project a pattern on the object in photographing, the projecting unit including an optical system having a projection view angle,

10 wherein the projection view angle of the optical system is set so as to project the pattern within a range where the photographing unit is able to photograph the object and on an overlapped area which is formed by overlapping photographing spaces capable of photographing the object from the viewpoints.

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2. The apparatus according to claim 1, wherein the projection view angle is set so as to project the pattern on an area which is smaller than the overlapped area and which includes at least the object.

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3. The apparatus according to claim 1, wherein the apparatus further comprises a three-dimensional reconfiguring unit configured to three-dimensionally reconfigure images of the object using an image picked up by the photographing unit, and

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the photographing view angle falls within a range which is measured by the three-dimensional reconfiguring unit and is set so as to project the pattern in

an area which is included in the overlapped area.

4. The apparatus according to claim 1, wherein
the photographing unit includes:

a camera having a photographing optical system;

5 and

a stereo adapter configured to guide images viewed
from the viewpoints to the photographing optical
system.

5. The apparatus according to claim 1, wherein
10 the projecting unit includes a projection view angle
adjusting unit configured to set and adjust the
projection view angle in accordance with the overlapped
area.

6. The apparatus according to claim 5, wherein
15 the projection view angle adjusting unit adjusts
a focal length of the optical system of the projecting
unit and thus adjusts the projection view angle, and
the projecting unit further includes:

20 a light source configured to emit light to
project the pattern; and

25 a projecting light source adjusting unit
configured to correct an amount of light emitted from
the light source, in accordance with the projection
view angle adjusted by the projection view angle
adjusting unit.

7. The apparatus according to claim 5, wherein
a table showing a correspondence between a view angle

of the photographing unit, relative positions of
the viewpoints of the photographing unit, congestion
angles of lines of sight from the viewpoints of the
photographing unit, and the overlapped area is stored,
5 and the projection view angle adjusting unit adjusts
the projection view angle with reference to the stored
table.

8. The apparatus according to claim 1, further
comprising an illuminating unit configured to
10 illuminate the object in photographing, the
illuminating unit including an optical system having
an illumination angle,

wherein the projection view angle and the
illumination angle of the optical system are set so as
15 to project the pattern on an area which is smaller than
the overlapped area and which includes at least the
object, and the area is illuminated.

9. The apparatus according to claim 8, wherein
the illuminating unit includes illumination angle
20 adjusting unit configured to adjust the illumination
angle in accordance with the overlapped area.

10. The apparatus according to claim 9, wherein
the illumination angle adjusting unit adjusts a focal
length of the optical system of the illuminating unit
25 and thus adjusts the illumination angle, and
the illuminating unit further includes:

a light source configured to emit light to

illuminate the object; and

an illuminating light source adjusting unit
configured to correct an amount of light emitted from
the light source, in accordance with the illumination
angle adjusted by the illumination angle adjusting
unit.

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11. The apparatus according to claim 9, wherein
a table showing a correspondence between a view angle
of the photographing unit, relative positions of the
viewpoints of the photographing unit, congestion angles
of lines of sight from the viewpoints, is stored, and
the illumination angle adjusting unit adjusts the
illumination angle with reference to the stored table.

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12. A three-dimensional photographing apparatus

comprising:

a photographing unit configured to photograph
an object from a plurality of viewpoints; and

an illuminating unit configured to illuminate
the object in photographing, the illuminating unit
including an optical system having an illumination
angle,

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wherein the illumination angle of the optical
system is set so as to illuminate an area which is
smaller than an overlapped area formed by overlapping
photographing spaces capable of photographing the
object from the viewpoints and which includes at least
the object.

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13. A photographing method of a three-dimensional photographing apparatus, comprising:

projecting a pattern on an object; and

5 photographing the object on which the pattern is projected, from a plurality of viewpoints,

wherein the projecting the pattern has a projection view angle which is set so as to project the pattern on an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints.

10 14. A photographing method of a three-dimensional photographing apparatus, comprising:

illuminating an object; and

15 photographing the illuminated object from a plurality of viewpoints,

wherein the illuminating the object has an illumination angle which is set so as to illuminate an area which is smaller than an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints and which includes at least the object.

20 15. A stereo adapter comprising:

an optical path splitting optical system configured to guide images of an object viewed from first and second viewpoints that differ from each other 25 to a photographing optical system of a photographing unit connected to the stereo adapter to acquire

a stereo image of the object; and

a projecting unit configured to project a pattern
on the object in photographing,

wherein when one of two boundary lines delimiting
5 a field of view from the first viewpoint which is
closer to the second viewpoint is defined as a first
boundary line, one of two boundary lines delimiting a
field of view from the second viewpoint which is closer
to the first viewpoint is defined as a second boundary
10 line, and the first boundary line and the second
boundary line intersect at an intersection point, the
projecting unit projects the pattern on an area in
which all points are distant from the intersection
point with respect to the photographing optical system,
15 the area being one of areas delimited by the first
boundary line and the second boundary line with the
intersection point at a top.

16. A stereo adapter comprising:

an optical path splitting optical system
20 configured to guide images of an object viewed from
first and second viewpoints that differ from each other
to a photographing optical system of a photographing
unit connected to the stereo adapter to acquire
a stereo image of the object; and

25 an illuminating unit configured to illuminate
the object in photographing,

wherein when one of two boundary lines delimiting

a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating unit illuminates an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

17. A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing unit including a photographing optical system; and

a projecting configured to project a pattern on the object in photographing,

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer

to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the projecting unit projects the pattern on an area in
5 which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

10 18. A three-dimensional photographing apparatus comprising:

15 a photographing unit configured to photograph an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing unit including a photographing optical system; and

an illuminating unit configured to illuminate the object in photographing,

20 wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating unit illuminates an area in which all
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points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

5 19. A stereo adapter connected to a photographing unit having a photographing optical system for three-dimensional photography, comprising:

10 an optical path splitting optical system configured to guide images of an object viewed from a plurality of viewpoints to the photographing optical system of the photographing unit connected to the stereo adapter;

15 at least one of a projecting unit configured to project a pattern on the object in photographing and an illuminating unit configured to illuminate the object in photographing; and

20 an illumination angle designating value changing unit configured to receive illumination angle information for illumination, which corresponds to a photographing view angle of the photographing unit connected to the stereo adapter, from the photographing unit and conform the received illumination angle information to a characteristic of the optical path splitting optical system, thereby to control at least one of a projection view angle of the projecting unit and an illumination angle of the illuminating unit.

20. A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a plurality of viewpoints; and

5 projecting means for projecting a pattern on the object in photographing, the projecting means including an optical system having a projection view angle,

wherein the projection view angle of the optical system is set so as to project the pattern within 10 a range where the photographing means is able to photograph the object and on an overlapped area which is formed by overlapping photographing spaces capable of photographing the object from the viewpoints.

21. A three-dimensional photographing apparatus 15 comprising:

photographing means for photographing an object from a plurality of viewpoints; and

illuminating means for illuminating the object in photographing, the illuminating means including 20 an optical system having an illumination angle, wherein the illumination angle of the optical system is set so as to illuminate an area which is smaller than an overlapped area formed by overlapping photographing spaces capable of photographing the 25 object from the viewpoints and which includes at least the object.

22. A stereo adapter comprising:

an optical path splitting optical system for
guiding images of an object viewed from first and
second viewpoints that differ from each other to a
photographing optical system of photographing means
5 connected to the stereo adapter to acquire a stereo
image of the object; and

projecting means for projecting a pattern on the
object in photographing,

wherein when one of two boundary lines delimiting
10 a field of view from the first viewpoint which is
closer to the second viewpoint is defined as a first
boundary line, one of two boundary lines delimiting a
field of view from the second viewpoint which is closer
to the first viewpoint is defined as a second boundary
15 line, and the first boundary line and the second
boundary line intersect at an intersection point, the
projecting means projects the pattern on an area in
which all points are distant from the intersection
point with respect to the photographing optical system,
20 the area being one of areas delimited by the first
boundary line and the second boundary line with the
intersection point at a top.

23. A stereo adapter comprising:

an optical path splitting optical system for
guiding images of an object viewed from first and
25 second viewpoints that differ from each other to
a photographing optical system of photographing means

connected to the stereo adapter to acquire a stereo image of the object; and

illuminating means for illuminating the object in photographing,

5 wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer 10 to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating means illuminates an area in which all points are distant from the intersection point with respect to the photographing optical system, the area 15 being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

20 24. A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing means including a photographing 25 optical system; and

projecting means for projecting a pattern on the object in photographing,

wherein when one of two boundary lines delimiting
a field of view from the first viewpoint which is
closer to the second viewpoint is defined as a first
boundary line, one of two boundary lines delimiting a
5 field of view from the second viewpoint which is closer
to the first viewpoint is defined as a second boundary
line, and the first boundary line and the second
boundary line intersect at an intersection point, the
projecting means projects the pattern on an area in
10 which all points are distant from the intersection
point with respect to the photographing optical system,
the area being one of areas delimited by the first
boundary line and the second boundary line with the
intersection point at a top.

15 25. A three-dimensional photographing apparatus
comprising:

photographing means for photographing an object
from a first viewpoint and a second viewpoint that is
located at a given distance from the first viewpoint,
20 the photographing means including a photographing
optical system; and

illuminating means for illuminating the object in
photographing,

wherein when one of two boundary lines delimiting
25 a field of view from the first viewpoint which is
closer to the second viewpoint is defined as a first
boundary line, one of two boundary lines delimiting a

field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating means illuminates an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

26. A stereo adapter connected to a photographing unit having a photographing optical system for three-dimensional photography, comprising:

an optical path splitting optical system for guiding images of an object viewed from a plurality of viewpoints to the photographing optical system of the photographing unit connected to the stereo adapter;

at least one of projecting means for projecting a pattern on the object in photographing and illuminating means for illuminating the object in photographing; and

illumination angle designating value changing means for receiving illumination angle information for illumination, which corresponds to a photographing view angle of the photographing unit connected to the stereo adapter, from the photographing unit and conforming the received illumination angle information to a characteristic of the optical path splitting

optical system, thereby to control at least one of a projection view angle of the projecting means and an illumination angle of the illuminating means.